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ABSTRACT

The study determined the: (1) relationship between dropout rates and the quality of education, teachers' qualifications, diversity of curriculum and extra-curricular activities, average town income, percentage of the high school population of American Indian or Metis descent, and school size; (2) effects of educational expenditures on business sales, jobs, and incomes in the Interlake Area of Manitoba; and (3) human capital value. The study's objective was to develop a viable framework for determining the role of education in the area's economic development. Data, obtained from the Department of Education and the 13 high schools in the Interlake Area, were analyzed by multiple regression analysis, an input-output table, and present value equations. Among the findings were: (1) the schools provided employment for a large number of teachers and support staff who spent money in the community and supported local businesses; (2) construction of schools provided jobs in the community and supported the level of local business sales; (3) the higher the town average income, the lower the dropout rate; (4) human capital value increased when the dropout rate was lowered; and (5) towns with low average income levels had teachers with low salaries and low qualifications which led to low quality of education. (NQ)

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Series 2: Research Report No. 10

Education in Area Economic Development

by
Paul Molgat and J.A. MacMillan

Center for
Settlement Studies

The University
of Manitoba

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EDUCATION IN AREA ECONOMIC DEVELOPMENT

by

Paul Molgat

and

J.A. MacMillan
Department of Agricultural Economics

Center for Settlement Studies
University of Manitoba, Box 3
Winnipeg, Manitoba
R3T 2N2

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PREFACE

Policymakers, educators and economists have long been concerned with the relationship between the costs and benefits of additional expenditures on education. Education expenditures account for the largest portion of provincial and local government budgets in Manitoba, as well as many other provinces. Are these massive expenditures yielding the hoped-for returns? In more basic terms, what are the expected returns to an additional dollar spent on education? How can the returns be measured?

Educators often argue that the benefits of education cannot be measured and that the benefits of education are self-evident and do not need analysis. Economists argue that education is a major factor contributing to economic growth. However, some economists suggest that previous analyses are so crude that the results do not have any significance.

To some extent there are obvious benefits to education for both individuals and communities. Everyone is familiar with the job advertisements which outline the differentials in earning associated with higher qualifications. Every rural mayor knows that if his town is selected as the site for the consolidated school that his town will grow. However, if his

town does not receive the school but another town nearby does, his town will suffer. Also, every parent is concerned about the quality of instruction that his children receive, knowing that if the instruction does not measure up to high standards, his children will lose out at university to children who have consistently had the best teachers available.

The present study attempts to document the ways in which parents, communities and governments can find out what the benefits of education are by contributing to an understanding of the role of education expenditures in the economic development of the Interlake Area.

The authors would like to express their gratitude to several people who provided comments and criticisms throughout the study--Dr. C. F. Framingham, Dr. J. Seldon and Dr. P. J. Husby, and to the anonymous reviewers solicited by the Center for Settlement Studies. In addition, data were provided by local school officials in the Interlake Area and the Manitoba Department of Education, and funds for the study were provided by the University of Manitoba, Center for Settlement Studies.

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SUMMARY OF FINDINGS

Education services have an important effect on local communities. A school provides employment for a large number of teachers and support staff. These people spend money in the community and support local businesses. Also, construction of schools provides jobs in the community and supports the level of local business sales. Due to such factors, the location of a school in a community plays an important role in the community's future growth.

It is estimated that out of the total educational expenditure of $7.4 million in the Interlake for primary and secondary education in 1968, $5 million were spent in the area; $1.7 million were spent on purchases by the local boards of supplies in Winnipeg, and $.7 million were spent on school buildings. Out of the $5 million spent in the area, $4.6 million were spent for wages to school staff and $.4 million for purchase of supplies from local businesses.

The wage payments were made to 59 principals, 536 full-time teachers, 10 part-time teachers, 4 superintendents, and several other full- and part-time administrative and custodian

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staff, as well as school bus drivers. The $5 million in wages and school supply purchases resulted in $3 million sales for local businesses and supported 99 jobs with income payments of $.6 million. These estimates were based on an input-output analysis and employment output functions.

Dropout rates were used as a measure of the quality of education, with the rationale that schools with low dropout rates are doing better in preparing students for coping in society and in job preparation. For the Interlake schools, the following factors were important in explaining variations in dropout rates among schools:

1. the higher the town average income, the lower the dropout rate;

2. the larger the number of extra-curricular activities, the lower the dropout rate;

3. the larger the number of course alternatives available, the lower the dropout rate;

4. the larger the percentage of Indian or Metis children, the lower the dropout rate;

5. the larger the school population, the higher the dropout rate.

The relative importance of each of these factors as a determinant of the dropout rates was calculated by means of multiple regression analysis. It was also generally found that

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towns with low average income levels have teachers with low salaries and low qualifications. This implies that schools in low income communities have low quality education, in spite of the equalizing influence of the Foundation Programs.

It is commonly accepted that if a student remains in school and successfully completes a higher grade, then that student's future earnings will be higher than if he dropped out. A dollar value was placed on the likely magnitude of such increments in lifetime earnings associated with higher levels of education. The costs of achieving the increments in education include expenditures by the student while going to school and the annual wages that a student could earn if he dropped out of school and worked. Work earnings are calculated for the average wage in the Interlake and for Selkirk.

Using average annual wage levels for the Interlake, it is estimated that an individual will benefit by $10 thousand over his working life by completing grade 12, rather than dropping out after completing grade 10. If the student completes university after grade 12, he will benefit by an average of a further $14 thousand in life-time earnings. The lifetime earnings are calculated by treating the value of the incremental earning due to education as a cash receipt over the working life, and then calculating the value of this cash

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flow in 1968 at 6% interest.

The study analyzes three issues worthy of additional detailed and extensive study: determinants of dropout rates, area job and income impacts of school expenditures, and individual income benefits associated with increments of education. An attempt is made to show how such partial analyses of education can be related to the broader critical problem of area economic development.

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POLICY IMPLICATIONS

Policymakers are becoming concerned about the undesirable implications of unrestricted urban growth, including increased costs of public service facilities (while rural facilities are not used), congestion, pollution, crime, etc. Also, rural people are concerned about the low quality of education received by their children due to the low level of rural tax revenues. If policymakers decided to slow down the growth of major urban centers and facilitate rural adjustment, improving the quality of rural education would be a means of achieving these goals.

A more rigorous analysis of the effects of education on an area could be based on a simulation model as an extension of the present study. Data required for the extended study include the effects on costs of changes in the number of courses and extra-curricular activities available at the school. Also, the changes in cost due to either the amalgamation or the separation of school facilities are required, i.e., what is the cost differential between one school of 300 students and two schools of 150 students each. With this data, the costs and effects of achieving alternative dropout rates could be determined.

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Conclusions useful in making policy decisions based on the results of the present study are:

1. Educational expenditures are an effective means of providing a stimulus to rural communities.

2. Communities with low average incomes have a low quality of education as measured by dropout rates. Consideration should be given to increasing course options, extra-curricular activities, and rural teachers' wages and qualifications, and reducing school size to improve the quality of education in rural communities. A continuation of the present low community income and low quality of education represents an inequity to rural youth.

3. Education expenditures are a means of facilitating the adjustment of rural communities to population decline. The higher the level of educational achievement of rural youth, the better the chances for improved future job opportunities.

The above conclusions are relevant only if a policy decision is made that rural communities merit expenditures in order to facilitate a slowing down of the growth of Metropolitan Winnipeg and to improve the adjustment of rural youth by providing a high quality of education that will ensure the greatest number of future job opportunities.

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The conclusions cited are useful in analyzing the role of education in the development of single enterprise communities in northern Manitoba. However, different estimates are required to adjust for particular features of northern communities. For example, the impacts of education expenditures in a northern community will be different due to the different economic structure of northern communities. Also, northern communities are likely to be more self-sufficient than communities of a comparable size close to Winnipeg. Teachers in towns close to Winnipeg will spend a large portion of their budget in Winnipeg, due to the easy access to large stores and the range of choice. In northern communities, purchases will either have to be made in the community or delayed.

Concerning the factors determining the magnitude of dropout rates in northern communities, it would be reasonable to expect the same set of factors to be important: average town income, teachers' wages and qualifications, course options, extra-curricular activities, percent of Indian and Metis, and size of school. However, the relative importance of these variables would in all likelihood be different. For example, it is likely that the percent of Indian and Metis would be more important in isolated communities than in the

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Interlake. Job income differentials associated with educational qualifications may also have to be adjusted to account for the likelihood of discrimination which would occur regardless of the level of education.

INTRODUCTION

Politicians, communities, parents and students are questioning the amount of money which should be spent for educating today's youth. It is to this broad issue that this study is directed. This study does not try to answer the question of how much money should be spent; rather, it examines the areas of education in which money should be spent, and tries to ascertain the effects of this spending in the Interlake Area of Manitoba.

This report first defines the area under study, and states the objective and the three relationships to be analyzed in order to achieve the objective. It also discusses in general terms the contributions which the study will make. Next, the literature related to the general concepts of the model being proposed in the study is reviewed. The following section examines the literature specifically related to the regression equation, and discusses briefly the input-output table and the present value equations. The source of the data and computational techniques used in the analysis are then presented. The next section presents the results of the three methods of analysis and their implications. The limi-

tations of the study and further research which can be carried out in related areas are discussed. Lastly, both the specific and general conclusions of the study are presented.

The Context

In his text, Principles of Economics, Alfred Marshall briefly mentions the effects that education has on people. He concludes that education ". . . will be profitable as a mere investment, to give the masses of the people much greater opportunities than they can generally avail themselves of."[1] He also states that education has two effects, a direct effect, ". . . immediate economic gain which the nation may derive from an improvement in the general and technical education of the mass of the people . . .,"[2] and a less direct but equally important effect of ". . . medical discoveries, which increases our health and working power; and . . . scientific work such as that of mathematics or biology, even though generations may pass away before it bears fruit in general material well being."[3]

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[1]Alfred Marshall, Principles of Economics (Toronto, Ontario: The MacMillan Company of Canada Ltd., 1964), p. 179.

[2]Ibid., p. 176.

[3]Ibid., pp. 179-180.

Examining the recent expenditures of Federal, Provincial and local governments, one might conclude that the three levels of government have indeed followed Marshall's philosophy. In Canada in 1967, education accounted for 20.9% of the total expenditures by all governments, and also accounted for 6.6% of Gross National Product. This represents a substantial increase since 1965, when educational expenditures were 16.4% of total expenditures and 4.8% of Gross National Product.[4]

Between 1965 and 1967, educational expenditures increased by about 27% of their relative share of total expenditure, and by about 37% of their relative share of Gross National Product. During these years, education became the department with the largest expenditures, exceeding social assistance (including veterans benefits), which had the largest expenditures in 1965. Of the total amount of goods produced in the Canadian economy, the amount consumed by the education sector has increased between 1965 and 1967.

The Economic Council of Canada has projected educational expenditures by all governments to 1975. They estimate an increase of $4.3 billion in educational expenditures from 1967 to 1975. This represents an annual percentage increase

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[4]Economic Council of Canada, Perspective 1975, Sixth Annual Review (Ottawa: Queen's Printer, 1969), p. 29.

of 8.6%[5].

In 1965, the Province of Manitoba spent $81,114,000 on education; in 1967, the amount had increased to $107,000,000, an increase of 32% in two years. The projected figure for 1975 is $172,800,000, or an increase of 61.8% in eight years.[6] The amount spent for education in 1967 by the Province of Manitoba represents 3.4% of Gross Provincial Income and 28.5% of total Provincial Government Expenditure.[7]

Expenditures for education services represent a substantial portion of local government expenditures. In this regard, the Interlake municipalities are similar to other municipalities in Manitoba, as their expenditures for educational services in 1968 represented 40% of the local budget.[8]

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[5] Ibid., p. 32.

[6] Manitoba Economic Consultative Board, Fifth Annual Review (Winnipeg: Queen's Printer, 1968).

[7] Gross Provincial Income for 1967 was $3,028 million and Provincial Government Expenditure for 1967 was $375,119,000. Both of these terms are analogous to the National Accounts definitions of G.N.I. and Federal Government expenditures. Statement by Pat Gannon, staff member of the Department of Finance, Manitoba Government, during a telephone interview on October 26, 1971.

[8] Manitoba Development of Urban Development and Municipal Affairs, 1968 Statistical Information Respecting the Municpalities of the Province of Manitoba and the Metropolitan Corporation of Greater Winnipeg (Winnipeg, Manitoba: Queen's Printer, 1969).

The Area

The Interlake Area of Manitoba extends over an area of 10,000 square miles, and incorporated a population of 57,270 in 1966. The southern boundary of the area is the perimeter highway north of Winnipeg; the northern boundary is approximately 52°10'N latitude. Lake Manitoba forms the western boundary and Lake Winnipeg is the eastern boundary.

This area of Manitoba has a lower than average standard of living, as well as a higher than average unemployment or underemployment rate. Well over one-third of the labor force in the Interlake Area are working at extremely low levels of productivity.[9]

To alleviate this situation, the Provincial and Federal Governments signed an agreement in 1967 to make expenditures in this designated area in an attempt to raise the standards of living for people in the Interlake. The objectives of the agreement are to be achieved by expenditures for various programs, one of which is education.

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[9]Canada Department of Forestry and Rural Development, Interlake Area of Manitoba, Federal-Provincial Rural Development Agreement (Agreement Concerning a Comprehensive Rural Development Plan for the Interlake Area of Manitoba) (Ottawa: Queen's Printer, 1967, p. 25.

Problem Statement and Objectives

The relationship between educational expenditures and area economic development is crudely illustrated in Figure 1. Reading the flowchart from top to bottom, educational expenditures can affect the quality of education by means of wage increases to improve qualifications and school facility construction and improvement. An increase in teachers' wages will increase town income levels by a small amount, depending on the proportion of teachers living in the community. The quality of education, measured by dropout rates, is affected by the aspirations and expectations of students (a sociological relationship).

Area economic development impacts in the short-term will occur due to school purchases in the community which support local jobs and income. Some purchases will also occur in Winnipeg.

There will also be impacts due to improvement in labor force quality in the area, as well as out of the area, as graduates move to Winnipeg and out of Manitoba. The improvements in labor force quality will also be associated with improved earnings of students. The additional earnings of students who stay in the area will have further economic impacts associated with their purchases from local businesses. However, such job placements will depend on the labor demand

in the area.

In a longer-term context, higher quality education should improve the options of rural youth. The higher the education level, the better the chances of a student getting a job in Winnipeg or in other major Canadian centers. Also, improvements in education quality in selected centers in the Interlake will provide an important stimulus to their future growth. The present situation of better quality schools in larger centers relative to rural centers in the Interlake acts as a deterrent to the potential growth of rural centers.

There are three methods of analysis used to determine these relationships. They are:

1. A regression equation is used to determine the relationship between dropout rates as a measure of the quality of education and teachers' qualifications, diversity of curriculum, diversity of extra-curricular activities, average town income, percentage of the high school population which are of Indian or Metis descent, and school size. The dropout rate is affected by the amount of money spent on the factors relating to education and other variables among the 13 communities. It is interesting to note that the school with the smallest enrollment (Ashern) has the highest dropout rate, 14%, and has low values for all other variables. However, the pattern is not clear-cut. Warren, another small enrollment school, has

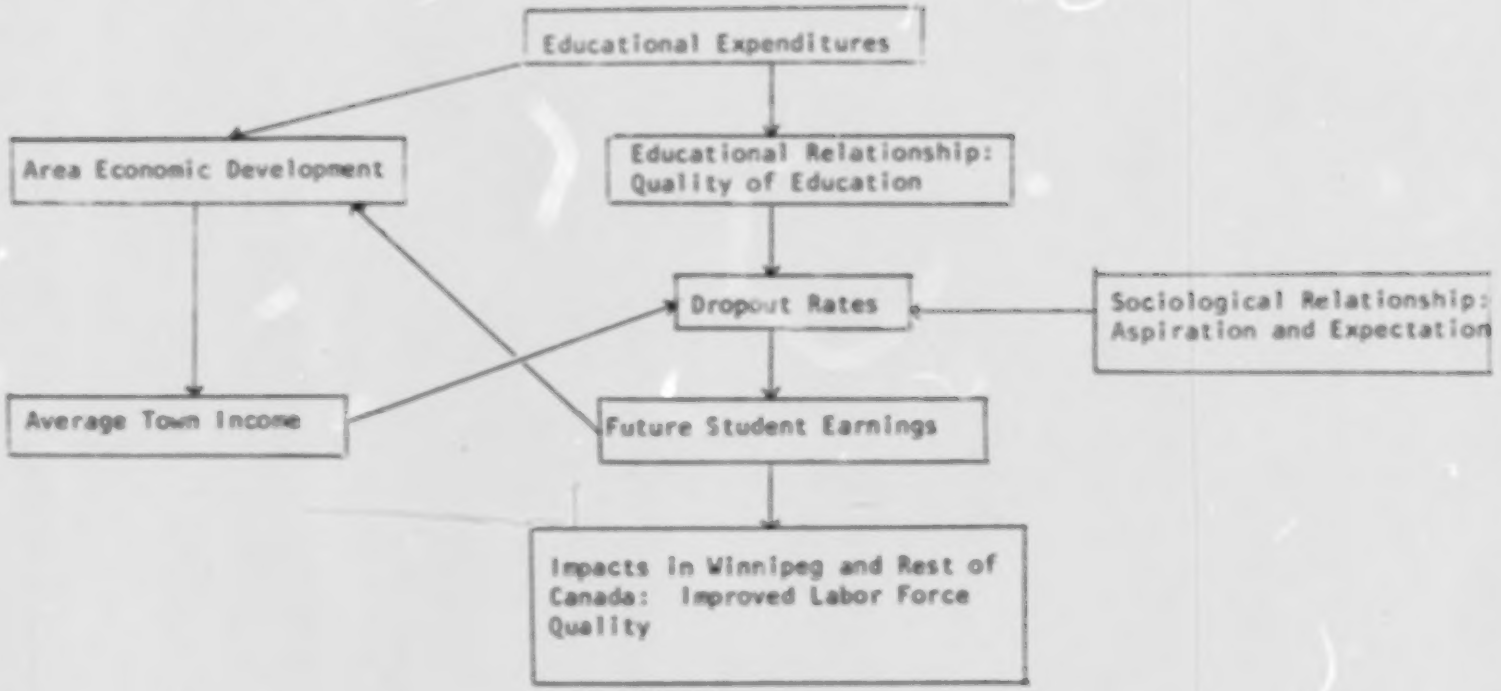
Educational Expenditures
Area Economic Development
Educational Relationship: Quality of Education
Dropout Rates
Sociological Relationship: Aspiration and Expectation
Average Town Income
Future Student Earnings
Impacts in Winnipeg and Rest of Canada: Improved Labor Force Quality

Figure 1: Interlake Area Economic Implications of Changes in Educational and Sociological Factors

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the lowest dropout rate, 1%, but Warren also registers high scores for teachers' salaries and other variables. The multiple regression analysis is a means of statistically sorting out the simultaneous relations between all the factors and the dropout rate (Table 1).

2. An input-output table is a means of determining the effects of educational expenditures on business sales, jobs and incomes in the Interlake Area. School board purchases from firms are grouped by sectors in Table 2. The major category is households, which represents wage payments by schools, and the wage payments support business sales for household consumption purchases. The business sales support income payments which, in turn, support further consumption purchases by families of business employees. The input-output table calculates the total of these rounds of business purchases, wage payments, consumption, business sales, etc. The sales estimates are translated into jobs by determining the average sales by sector which support a job (Table 3).

3. Present value equations are used to determine the increased human capital value that will occur if the dropout rates are lowered. If dropout rates are lowered, then the educational qualifications of rural youth will be increased and future earnings will be higher. For example, if the dropout rate for all schools could be reduced to 1% (the

Table 1: Selected School and Community Characteristics

Towns ↓ / Variables →	x_1 Drop-out rate	x_2 Average Town Income	x_3 Teachers' Salaries	x_4 Courses Available	x_5 Extra Curricular Activities[a]	x_6 Proportion of School Population of Indian or Metis Descent	x_7 Size of School
Selkirk	.0732	9352	8079	3	3.8	.1000	1256
St. Laurent	.0847	3979	7560	1	1.0	.5000	118
Stonewall	.0345	6698	8530	2	2.5	.0435	464
Teulon	.0383	6505	8395	2	1.5	.0500	313
Warren	.0136	6324	9225	2	1.9	.0000	220
Arborg	.0435	5435	7455	3	1.1	.0250	161
Gimli	.0417	5783	8310	3	1.5	.0777	503
Riverton	.0205	5527	7940	1	.9	.1000	146
Ashern	.1413	5156	5865	0	1.0	.0100	92
Eriksdale	.1028	5998	7590	0	.8	.0727	107
Fisher Branch	.0413	4662	6960	1	1.1	.1041	242
Lundar	.0680	3430	6580	0	1.8	.1000	103
Moosehorn	.1428	4018	6530	0	1.0	.0500	119
Average (13 obs.)	.068	5605	7617	1.38	1.50	.0948	296
(11 obs.)	.063	5412	7580	1.27	1.40	.0575	225

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Source:

Column 1: Dropout rate is calculated by dividing the school size by the number of dropouts per school.

Column 2: Average town income is calculated by finding the weighted average of the urban, rural non-farm and rural farm household income.

Column 3: Teachers' average salary by town is calculated by summing all teachers' salaries for the given town, then dividing by the number of teachers.

Column 4: Courses available are obtained from information supplied by the principals of each high school (see Appendix).

Column 5: Extra-curricular activities available are obtained from information supplied by the principal of each high school.

Column 6: Percentage of the high school population of Indian or Metis descent is obtained from information supplied by the principal of each high school.

Column 7: School size (the number of full-time students enrolled) is obtained from the Department of Education records.

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droput rate for the lowest school) then a substantial increase in students completing Grade 12 would occur in the area. The increase in the students' future earnings can be calculated. In addition, the results of the multiple regression equation can be used to determine the alternative means of achieving a reduction in the dropout rate for the Interlake Area. For example, an estimate of the number of extra-curricular activities required to reduce the dropout rate can be calculated. Furthermore, the input-output model can be used to calculate the increase in average town income associated with increases in educational expenditures (or other types of public expenditure programs required to achieve the lower dropout rate. The multiple regression analysis could then be used to calculate the increase in average town income and the further reductions in the Interlake Area.

The objective of this study is to develop a framework which will relate the role of education to area economic development, i.e., a framework which will measure the effects of educational expenditures on the Interlake Area.

The total effects of any expenditures would influence many different disciplines, but in this analysis the economic results will be emphasized. Some sociological consequences and implications will also be discussed.

To achieve the main objective, three relationships are

Table 2: Classification of Interlake Educational Expenditures for 1968 by Industrial Sectors and by Household Sector

Industrial Sectors	Educational Expenditures in Dollars
Agriculture Livestock	
Agriculture Crops and Others	
Mining	
Food and Beverage Manufacturing	
Other Manufacturing	3,634
Transportation	23,777
Construction	14,656
Petroleum Wholesale	201,475
Farm Equipment and Building Material	
Food Stores	
Other Retail	132,492
Auto Products Sales and Services	50,258
Apparel and Shoes	
Furniture and Appliances	
Insurance	1,412
Personal Services	
Other Services	34,121
Total Sales	461,896
Households	4,594,067
Total Sales and Income	5,055,996
Expenditures Outside the Interlake Area	1,661,219
Capital Expenditures	686,316
Total Education Expenditure for the Interlake Area	7,403,531

Source: Summation of "Expenditure Details as summarized in the Statement of Revenue and Expenditures for the year ended December 31, 1968," obtained from Manitoba Department of Education for the entire Interlake Area.

Table 3: Employment Coefficients by Industrial Sectors

		Direct Employment Coefficients[a]
1.	Agriculture Livestock	0.0
2.	Agriculture Crops and Others	0.0
3.	Mining	0.039
4.	Food and Beverage Manufacturing	0.022
5.	Other Manufacturing	0.052
6.	Transportation	0.134
7.	Construction	0.045
8.	Petroleum Wholesale	0.019
9.	Farm Equipment and Building Material	0.013
10.	Food Stores	0.015
11.	Other Retail	0.025
12.	Auto Products Sales and Services	0.013
13.	Apparel and Shoes	0.025
14.	Furniture and Appliances	0.034
15.	Insurance	0.130
16.	Personal Services	0.035
17.	Other Services	0.153
18.	Household	0.0
	Total	0.754

[a]Vector of direct employment coefficients (number of full-time employee equivalents per $1,000 sales).

Source: James A. MacMillan and Chang-Mei Lu, "Area Manpower: Projection and Impact Model", Research Bulletin (Winnipeg, Manitoba: Department of Agricultural Economics, University of Manitoba), p. 75.

examined, namely:

1. The estimation of the regression coefficients to determine significant variables which affect dropout rates.

2. The determination of the effects of educational expenditures on area sales and incomes by use of an input-output table.

3. The calculation of present value equations of benefits and costs to determine the economic returns associated with higher levels of education.

The objective of the study will be attained by combining the solutions of the three relationships defined above.

Contribution of the Study

The contribution of the study will be to facilitate policy-makers with decisions concerning expenditures for education in the Interlake Area. The model is designed to examine two aspects of educational expenditures, namely, the effects on the student and the economic effects on the area. The model also shows the net benefits attributable to increased education. The quanitification of the model will point out two things: the area of education where funds should be spent to encourage students to remain in school, and the result that the above expenditures will have on the area. Knowing this, the policy-makers can determine, a priori, the effects of

educational expenditures and can compare these effects to other types of expenditures in the area.

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REVIEW OF THE LITERATURE

The Investment-Consumption Dichotomy

In analyzing the educational expenditures of the Interlake Area, it must be decided whether the approach will be based on consumption or investment concepts. One difference between physical capital and human capital is that physical capital is usually considered as giving rise to a flow of investment returns, whereas human capital can provide both an investment return and immediate consumer satisfaction. As a consumption good, individuals obtain pleasure through increased knowledge; education can also yield a series of returns in the future, and is therefor an investment good.[10]

To classify the consumption and investment component of education, various methods have been described:

1. Income elasticity--all expenditures on education are assumed to be for consumption purposes and the amount of

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[10]Bruce W. Wilkinson, Studies in the Economics of Education, Occasional Paper No. 4 (Ottawa: Economics and Research Branch, Department of Labour, 1965), p. 7.

education demanded as income increased is calculated.[11]

2. Separating high school expenditures and beyond from elementary school expenditures--it is assumed that elementary school expenditures are of a consumption nature, while expenditures beyond elementary school are investment expenditures.[12]

3. Count all outlays in education as investment--this method assumes that all education contributes to potential productivity, and every person is a potential member of the labor force and represents an investment in human capital. From this method a maximum capital value can be calculated.[13]

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[11] Studies have been carried out to measure the income elasticity of education, i.e., the change in demand for education as income increases. See Conrad W. Sigurdson, "An Analysis of the Educational Effort of a Single Enterprise Community: Lynn Lake" (unpublished Master's dissertation, University of Manitoba, 1970); see also John Bock, "An Analysis of the Educational Effort of a Single Enterprise Community: Flin Flon" (unpublished Master's dissertation, University of Manitoba, 1970). A study by Brazes obtained an income elasticity of .73, while Schultz obtained an income elasticity of 3.5. See Wilkinson, op. cit., p. 8.

[12] No study using this method of separating consumption from investment has been found. Ibid., pp. 8-9.

[13] This method of analyzing educational expenditures is used by Wilkinson, Ibid., Ch. II.

Of the three methods of separating the income and investment components of human capital expenditures, the third method is likely to be the most useful, although none of the three are without problems.[14]

Vaizey[15] concludes that education should be compulsory up to a certain age because education has a redistribution effect between income groups. Burkehead[16] comes to the same conclusion as Vaizey, but mentions how redistribution occurs. Imposing a certain amount of education on lower-income people will redistribute income if they do not pay taxes to support education. The conclusion that lower-income people would likely obtain less education without compulsion is one inference which can be drawn from Siemens'[17] study of family factors. Generalizing from this conclusion, one might conclude that lower-income people may not take advantage of education

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[14] Ibid., pp. 8-9.

[15] John Vaizey, "Criteria for Public Expenditures on Education," The Economics of Education, eds. E.A.G. Robinson and John Vaizey (New York: St. Martin's Press, 1966), p. 455.

[16] Jesse Burkehead, Public School Finance, Economics and Politics (Syracuse, New York: Syracuse University Press, 1964), p. 13.

[17] Leonard B. Siemens, The Influence of Selected Family Factors on the Educational and Occupational Aspiration Levels of High School Boys and Girls (Winnipeg, Manitoba: The Faculty of Agriculture and Home Economics, University of Manitoba, 1965), pp. 61-62.

beyond the prescribed minimum. This may tend to redistribute some of the benefits of education towards the middle-income people who have the greatest power in determining educational spending and standards.[18]

The conclusion which can be drawn from these statements is that if lower-income families take advantage of the educational facilities by going beyond the prescribed minimum, income redistribution towards lower-income people will likely occur. On the other hand, if only the prescribed minimum education is obtained, then the income will be redistributed towards the middle-income people.

Because this study is interested in assessing the long-term benefits of education, it is assumed that education is an investment good. Considered in this way, education can be expected to contribute to growth. A measure of this contribution is needed.

Measuring Educational Productivity

There are five indicators mentioned in the literature that are used as surrogates for the productivity of education. The five indicators are: years of schooling, cost of production

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[18] Vaizey, op. cit., p. 456.

or replacement, discounted value of future earnings, cost-benefit analysis and the residual approach. These five methods will be briefly described below.

1. Years of Schooling[19]--It is possible to obtain a total of all the years of education in the economy. However, a better method is to determine the average level of education of all occupations in the entire work force. Neither of these methods account for the monetary values of educational investment which is often more essential.

2. Cost of Production or Replacement[20]--The cost of production method of calculating human resources involves pricing the capital at the cost of the resources for one year; the cost of replacment is the cost of resources needed to replace the capital at present. Either method can be used, depending upon the purpose of the study.

The main problem with this approach is in determining the method of measuring foregone earnings. Foregone earnings should be included as a cost, since a person continuing school is losing income that would be earned if he were employed.

However, there are problems involved, such as how to deal with unemployment, and how to account for the individual's

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[19]Wilkinson, op. cit., pp. 9-10.

[20]Ibid., pp. 10-16.

capabilities in determing what his income would be if he were working. There is also the problem of determining society's benefit from increased levels of education. All of the other costs, such as teachers' salaries, operation costs and incidental expenses such as books or travel, are easily measured.

3. Discounted Value of Future Earnings[21]--This method consists of discounting to the present the value of a person's lifetime earnings. The problem associated with this analysis lies in predicitng the future earnings of the individual. Many structural parameters of employment could greatly affect the outcomes. Another problem lies in determining what interest rate is to be used to discount future earnings. The higher the interest rate, the smaller the present value. As the interest rate plays such an important role, there is much discussion as to which interest rate should be used. There are also some non-monetary gains attributable to education, and when a present value of future earnings is found, the analysis does not account for this and the benefit is biased downward.

4. Cost-Benefit Analysis[22]--A cost-benefit analysis seems to be an appropriate tool to measure the worth of educa-

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[21] Ibid., pp. 16-25.

[22] Burkehead, op. cit.; see also Charles S. Benson, The Economics of Public Education (Cambridge, Massachusetts: Riverside Press, 1961).

tion programs. Although a very good measuring tool in theory, the application of benefit-cost analysis to educational expenditures has several serious difficulties, namely:

(a) Many of the benefits, especially those to society, and the consumption aspect of education to the individual are not quantifiable.

(b) The returns to educational investment occur over a long period of time and can only be estimated very crudely, and with such a long spread in returns that the question of which interest rate is appropriate becomes significant.

(c) Although estimates of manpower requirements have given indications as to the direction of educational spending, the relationship between skilled manpower and output is complex and subject to qualification.

This type of analysis is suggested by both Vaizey[23] and Burkehead.[24] Burkehead concludes that benefit-cost analysis would be good for comparing similar projects, but not as good for measuring multipurpose projects. Vaizey points out the many difficulties of using benefit-cost analysis, and concludes that using such an analysis will not answer the question of how much ought to be spent on education.

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[23]Vaizey, op. cit., p. 457.

[24]Burkehead, op. cit., pp. 8-10.

The Economic Council[25] uses an internal rate of return[26] to measure the returns to society and individuals by areas of Canada. It is mentioned that the purpose of education is not solely an investment objective, and that the rate of return must be interpreted cautiously as it measures only the investment aspect of education. However, there is also cultural development and equality of opportunity goals which must be achieved. It is not mentioned how these two goals can be measured.

5. The Residual Approach[27]--This measurement technique is used to determine what part of increased output is attributed to increased input, and that amount which cannot be attributed to increased input is called the residual. One important part of the residual is education, as it increased the quality of the work force.

The residual approach is most often used as a surrogate

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[25]Economic Council of Canada, Design for Decision Making (An Application to Human Resources Policies), Eighth Annual Review (Ottawa: Queen's Printer, 1971), pp. 205-213.

[26]The internal rate of return is the interest rate which equates benefits and costs.

[27]Wilkinson, op. cit., pp. 25-27.

educational productivity. Schultz[28] measures economic growth between 1929 and 1957 for the United States. He concludes that, in the period 1929 to 1957, education contributed between 16.5% and 20% to economic growth. This supports Dennison's claim that education contributed about 21% of economic growth.[29]

This method of calculating educational productivity is criticized by Burkehead,[30] because it is impossible to separate educational returns from other personal characteristics such as, sex, ability, background, and other sociological, psychological or environmental aspects. Benson[31] agrees that education plays an important role in increasing the productivity of a nation, but concludes that education with respect to increasing productivity must rest its case not on carefully tested hypotheses, but on general assumptions that the quality of school programs helps the economy in its search for greater efficiency. Wilkinson[32] concludes that although these resid-

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[28]Theodore W. Schultz, The Economic Value of Education (New York: Columbia University Press, 1963), pp. 42-46.

[29]Ibid., p. 44.

[30]Burkehead, op. cit., p. 6.

[31]Benson, op. cit., pp. 344-351.

[32]Wilkinson, op. cit., pp. 22-27.

uals are an imperfect measure, the analysis has major contributions and research should continue along these lines to refine this technique.

The conclusion that follows from the above discussion is that all the methods of calculating educational productivity have some problems of measurement, and the use of any one method, although it would give some indication of the productivity of education, would not be precise.

It is not feasible to use the residual approach in this study, as the system of accounts needed for the Interlake Area is not available. To measure the effects of greater amounts of education, this study uses a combination of two methods--the present value method and a net benefit calculation. The present value of future earnings and the present value of future costs are calculated; from this a net benefit is derived.

Education in Area Development

Educational expenditures have a twofold effect. The first is to create employment and income for the area, and the second effect is to increase a student's future earnings by increasing education levels, thereby aiding area development. The latter effect is discussed in this section.

The Economic Council of Canada[33] discusses regional differences in education. It is stated that the incomes of people tend to be closely correlated to the extent of schooling. It is also mentioned that the rates of return on educational investments compare favorably with other investments. Tweeten[34] concluded that, although short-run returns to education may be insignificant, long-run expenditures are a worthwhile investment for alleviating rural poverty.

In the Eighth Annual Review,[35] rates of return to education are quantified. These rates of return are calculated for society, for individuals, for high schools and for universities. The rate of return for individuals and society tends to be greater for high school students in the Atlantic provinces.[36] Society's and individual's returns from university

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[33]Economic Council of Canada, Perspective 1975, Sixth Annual Review (Ottawa: Queen's Printer, 1969), p. 123.

[34]Luther G. Tweeten, The Role of Education in Alleviating Rural Poverty, U.S. Department of Agriculture, Agriculture Economic Report No. 114 (Washington, D.C.: Government Printing Office, 1967).

[35]Economic Council of Canada, Eighth Annual Review, pp. 205-213.

[36]Ibid., Chart 9-2, p. 209.

education were similar for all regions of Canada, although the Atlantic provinces now have the lowest returns.

In the Sixth Annual Review,[37] quality measures of education such as student-teacher ratios, teacher qualifications, student retention rates, expenditures per student, and also various types of institutions, systems, programs, and curriculums are discussed. In their analysis, the Economic Council evaluates the differences for 1966-67, and brings out the variance between provinces. No conclusions are drawn for policy recommendations from their evaluation, but they point out directions for further research. The Council also notes that variations within the province are not examined; but these differences could vary even more drastically than those among provinces.[38]

These variations within the province could be one reason why some areas are underdeveloped. Spitze[39] concludes that underdeveloped areas are usually rural areas; one reason

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[37]Economic Council of Canada, Sixth Annual Review, pp. 132-136.

[38]Ibid., p. 210.

[39]R.E.F. Spitze, "Problems of Adequacy in Rural Human Resource Development Concepts and Accomplishments," Benefits and Burdens of Rural Development, ed. Iowa State Center for Agriculture and Economic Development (Ames, Iowa: Iowa State University Press, 1970).

for this is that rural area people are generally less knowledgable of the various opportunities available than are urban people. Rural people, therefore, are at a disadvantage because they have a lower level of living and are relatively isolated from the larger public service facilities. Also, due to their isolation, rural people have much less accessibility to the communications media, which in turn reduces the knowledge of occupational mobility. The lack of response to knowledge of occupational mobility may be caused by the large amount of assets the farmer has, which limits his exit from this type of employment.

Not only are the rural people at a disadvantage in terms of knowledge of available opportunities, but they may have an inferior educational position because lower incomes permit fewer expenditures and savings. Lower labor returns are likely to be more common in rural areas.

As well as having lower incomes, rural areas must pay higher costs for educating their youth than do urban people. These increased costs, due to transportation, smaller unit sizes, and an increasing range of courses, are placing great burdens on the rural people.[40]

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[40] In Manitoba, the Foundation Program redistributes revenues to rural areas. The Foundation Program pays approximately 75% of total cost with the local school division paying 25%.

It follows from Spitze's conclusion that one method of alleviating rural poverty would be to provide better educational facilities at a cost which can be borne by the rural areas. This would mean some type of redistribution from urban areas to rural areas, thereby helping remove the isolation barrier of rural people.

The question that is often asked is whether low incomes cause poor education or whether it is because of poor education that incomes of these people are low. Some authors contend that it is the family background that has the greatest effect on educational achievement, and the method of breaking this vicious circle is to alleviate the economic and social difficulties of the families. For example, in a report to the President of the United States on minority groups, it was concluded that the student's background was the important variable in education achievement. It was stated thus:

> This is not to say, of course, that schools have no effect, but rather that what effects they do have are highly correlated with the individual student's background, and with the educational background of the student body in the school; that is, the effects appear to arise not principally from factors that the school system controls, but from factors outside the school proper. The stimulus arising from variables

independent of the student background factors appears to be a weak one.[41]

Sexton's[42] study of an urban area concluded that much of the reason for poor academic achievement was due to the lack of proper facilities (not only educational facilities, but recreational and cultural ones as well) in the ghetto areas. It was thought that alleviating the social and economic problems of the area would likely help in lessening the discrepancy between the more and less affluent parts of the city. If you decrease the ghetto peoples' plight by increasing their incomes and improving social conditions of the area, this will raise these peoples' educational achievements, thereby helping the children escape the ghetto.

Many of the social problems of the ghettos in large cities cannot be generalized to the poor rural areas, but one important factor is common to both, and that is income. Raising people's income in both areas is one step towards breaking the vicious circle in which low-income people tend to have low educational achievement, and that low achievers become low-income people in the next generation.

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[41] James S. Coleman et al., Equality of Educational Opportunity; Report of a Survey, submitted to the President and Congress under Sec. 402 of the Civil Rights Act of 1964, by the National Center for Educational Statistics (Washington, D.C.: Government Printing Office, 1966), p. 312.

[42] Patricia Cayo Sexton, Education and Income (New York: Viking Press, Inc., 1966).

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MODEL FORMULATION

The regression equation results test the hypothesis that aspirations (measured in this study by a surrogate: income of the parents averaged over each town) and/or the quality of a school will encourage students to remain in school for a longer time. The dropout rate is the dependent variable in the study. Aspirations, three quality measures, and the fraction of the high school population which is of Indian or Metis descent are the independent variables. The quality variables are teachers' salaries (a surrogate for teacher qualifications) and a ranking of courses and extra-curricular activities available at each high school.

In this section, three methods of analysis are considered. The regression equation is discussed with respect to the six independent variables. The input-output table and the present value equations are set forth and some of the problems associated with their formulation are discussed.

Regression Equation

In this study, dropout rates are considered to be a link between the quality of education, social and economic variables, and the future earnings of students. Dropout rates are also a type of productivity measure, in that the objective

of schools is to develop student abilities, thereby making the students better employees. If an increase in the quality of education makes a student remain in school for a longer period of time, then he will likely be a more employable person. It is assumed that greater amounts of education equip students to do better work. Therefore, it can be said that the dropout rate is a measure of the education system's productivity.

One factor which affects dropout rates is the income of the parents. A study dealing with this factor was conducted in the United States; it showed that in large urban centers dropout rates and income class tend to be closely related.[43] Lower income people generally have poorer facilities, more poorly qualified teachers, over-crowded schools, fewer recreation areas. Lower income people have a worse educational and social environment, and this puts their children in an inferior position of learning from an early stage. Therefore, these students tend to fall further behind the students of higher income families. It would seem that these students tend to give up, that is, they lose their aspirations. The applicability of these results is not mentioned in this study, but it would seem that these differences may also occur between urban

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[43]Patricia Cayo Sexton, Education and Income (New York: Viking Press, Inc., 1966).

and rural populations.

The conclusions arrived at by Guest[44] lend support to a study by Siemens and Jackson,[45] which deals with the fulfillment of student aspirations--the higher the student's aspirations, the greater the chance that the student will fulfill his aspirations. Guest's study found that of the 67% aspiring to go to university, only 39% withdrew. Comparing the four courses offered, we can see that withdrawals increase as aspirations decrease. Withdrawals from the university entrance course are 6.3%, general course dropouts totalled 15.9%, and industrial and commercial courses withdrawals are 24.4% and 26.6% respectively.

As mentioned earlier, the study by Siemens and Jackson supports the conclusions that the higher the aspirations the better the chance of fulfilling one's aspirations. Comparing percentages of fulfillment by various levels it is found that:

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[44]Harry H. Guest, A Study of Student Withdrawals From Schools in the Winnipeg School Division No. 1 ([Winnipeg, Manitoba]: n.n., 1968).

[45]Leonard B. Siemens and Winston J. E. Jackson, Educational Plans and Their Fulfillment: A Study of Selected High School Students in Manitoba (Winnipeg, Manitoba: The Faculty of Agriculture and Home Economics, University of Manitoba, 1965).

of those planning on university entrance	62% enrolled
of those planning on teacher training or nursing	58% enrolled
of those planning on business or technical training	35% enrolled

This study also found other variables related to fulfillment of aspirations. It is found that more Protestants tend to fulfill their aspirations compared to Catholics. The study shows that 53% of the Protestants and 29% of the Catholics fulfilled their plans. It is also found that ethnic origin is a significant factor.[46]

The author suggests four main reasons for non-fulfillment, namely:

1. The student's innate ability--I.Q.[47]
2. The financing of an extended period of training.
3. The motivation of the student.
4. The social acceptance of such training by the student's elders and peers.

One of the two reasons for non-fullment is student motivation or aspiration. Two studies completed on Manitoba

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[46] It is interesting to note that socio-economic status was not related to past high school plan fulfillment, although it was significantly related to student aspirations.

[47] For a discussion of I.Q. tests as a measure of innate ability, see a study by Patricia Cayo Sexton, Education and Income (New York: Viking Press Inc., 1966); see also Richard Hernstein, "I.Q.," The Atlantic Monthly, September, 1971, p. 55.

high school students,[48] one dealing with school-related factors, while the second deals with family-related factors determined the effects on, or relationship to, student aspirations.

For the relationship of school-related factors and aspirations, eight variables are tested and the conclusions are:

1. There is a variation between rural and urban youth aspirations, with urban youth having higher aspirations.

2. There is no consistent relationship between aspirations and the distance from the school or the number of schools attended.

3. Generally (except for low S.E.S.[49]), the higher the I.Q., the greater the aspirations.

4. High school examination grades are most consistently related to aspiration levels--especially for Grade IX students.

5. For the low S.E.S. group, the more teacher encouragement, the higher the aspiration.

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[48] Dennis P. Forcese and Leonard B. Siemens, School-Related Factors and the Aspiration Levels of Manitoba Senior High School Students (Winnipeg, Manitoba: The Faculty of Agriculture and Home Economics, University of Manitoba, 1965); see also Leonard B. Siemens, The Influence of Selected Family Factors on Educational and Occupational Aspiration Levels of High School Boys and Girls (Winnipeg, Manitoba: The Faculty of Agriculture and Home Economics, University of Manitoba, 1965).

[49] S.E.S. is socio-economic status.

6. For middle and upper S.E.S. groups, the greater the extra-curricular activities, the higher the aspirations.

For the family related factors, the conclusions are that educational and occupational aspirations for boys and girls are related to the following variables:

1. Socio-economic status of the parents.

2. The occupational status of the father.

3. The level of the father's (and mother's) educational achievement for boys and only the father's educational achievement for girls.

4. The strength of both the father's and mother's encouragement.

It was found that the religious background of the boys influenced aspiration levels, and also that boys in towns with a population less than 500 have higher aspiration levels than those in towns with a population from 500-2500. For girls, the larger the town, the greater the aspiration.

An attempt was made to directly incorporate aspirations as a variable in the analysis. Data are available showing the aspiration level of students in the Interlake Area in 1964 from a study conducted by Siemens.[50] There are two reasons for not completing this specification of the regression equation.

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[50] Siemens, op. cit.

1. The dropout rates for 1964 are to be computed using the Department of Education records. This is to be accomplished by determining whether a student is promoted from the grade he was registered for in the spring term to the next grade in the fall term. This is not an accurate method as it did not account for the students transferring in or out of schools during the summer months.

2. The aspiration of students in the Interlake Area did not include Selkirk in the 1964 study. Selkirk is expected to be a significant part of the Interlake Area as delineated for the purpose of the Interlake study, and if possible it should be included.

Aspirations are a very important variable in the equation as they represent much of the home environment of the student. As this study uses secondary source data, it is impossible to use aspirations as a variable. For each town, the average income of the town is used as a surrogate.[51]

Hypotheses

Income is needed as a variable because it represents

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[51] A correlation between the S.E.S. scale and incomes is given in a study by Molgat to indicate that income is a surrogate for aspirations. See P. Molgat, "Education in Area Economic Development" (unpublished Master's dissertation, University of Manitoba, 1971), Appendix A.

much of the attitudes towards school which are derived from the home environment. As was found in Siemen's study, the higher the S.E.S. level, the higher the aspiration, so this would indicate that high schools in more affluent towns would tend to have lower droput rates. Higher S.E.S. people tend to encourage their children to obtain more education and are also financially capable of helping their children to go through school. Therefore, it is hypothesized that the higher the average town income, the lower the dropout rates.[52]

It can be argued that the income variable must affect the dropout rates and not vice versa, as a student who drops out of school would not affect his parents' income.[53] If this statement is generalized to the town, the dropouts of a high school cannot increase the average income of the people in the town. Dropping out of school may affect the future income of that student, as well as his children's aspirations, but the relationship cannot be reversed. It is therefore justified to regress dropout rates upon the income variable.

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[52]A student aspiration variable was used in a study carried out by the Economic Council, Design for Decision Making, An Application to Human Resources Policies, Eighth Annual Review (Ottawa: Queen's Printer, 1971), p. 204.

[53]This is assuming that the student who drops out of school does not give his parents his income. Disposal income of parents may change, but not their net income.

There are three variables used to measure the quality of schools. In all three cases, some type of measure had to be found to represent quality in a numerical sense. For teacher qualifications, the salaries of the teachers are used.[54] Both of the other variables, namely, courses available at the school and extra-curricular activities, are measured using a scale to represent respective amounts of each variable available at high schools. It is hypothesized that the higher the wage, the better the teacher, the more interesting and appealing the subject matter will be, and the more the teacher will likely encourage the student. This raises the aspirations of the student, as was shown in Siemen's study.[55] For the other two quality variables, it is hypothesized that the greater the range of courses offered, the more chance that the student will find a suitable course and will therefore tend to remain in school for a longer time. The same holds true for extra-curricular activities, which should hold the student's interest and make him feel a part of the school atmosphere, which in turn should encourage the student to stay in school.[56]

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[54]Salaries are not an ideal measure, but there is no other available standard. A primary source could be developed by having students and supervisors rate teachers' abilities, but only secondary source data are being used in this study.

[55]Forcese and Siemens, op. cit., pp. 18-19.

[56]Similar variables to these three are used in the study by the Economic Council, op. cit., p. 204.

The fifth variable, the percentage of the high school student population which are of Indian or Metis descent, is used because it is felt that Indian and Metis people tend to have lower aspirations than other nationalities. This is due to the social environment in which they live.[57] It is hypothesized that the higher the percentage of high school students of Indian and Metis descent, the higher the dropout rate.

The size of school, a sixth variable used, is hypothesized to vary inversely with dropout, that is, that the larger the school, the lower the dropout rate. The reason for this is that larger schools have more facilities and it should be easier for a student to find the combination of courses which he prefers.[58]

The above hypotheses are summarized in Table 4. The algebraic representation for Table 4 is stated as follows:[59]

$$X_1 = b_o - b_1 x_2 - b_2 x_3 - b_x x_4 - b_4 x_5 + b_5 x_6 - b_6 x_7 \qquad (1)$$

Where: X_1 = dropout rates--measured by the number of dropouts divided by the size of the school;

x_2 = average income of each town--measured in dollars;

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[57] It is felt that this variable is particular to this area and should be included in the analysis.

[58] A study by Jesse Burkehead, Public School Finance, Economics and Politics (Syracuse, New York: Syracuse University Press, 1964), p. 62, uses size as an independent variable. The dependent variable was expenditure per pupil.

[59] The source of thedata and the method used to compile the data are discussed in the following section.

Table 4: Summary of Hypotheses

Variable Number		
x_2	Average town income	The higher the average town income, the lower the dropout rate.
x_3	Teachers' average salary by town	The higher the teachers' average salary, the lower the dropout rate.
x_4	Courses available	The greater number of course options, the lower the dropout rate.
x_5	Extra-curricular activities	The greater the number of extra-curricular activities, the lower the dropout rate.
x_6	Percentage of high school students of Indian or Metis descent	The greater the percentage of Indian and Metis students in a high school, the greater the dropout rate.
x_7	Size of school	The larger the school, the lower the dropout rate.

x_3 = average teachers' salaries--measured in dollars;

x_4 = courses available at each high school--measured using a scale from 0 - 4;

x_5 = extra-curricular activities available at each high school--measured by a scale where each extra-curricular activity is equal to .1;

x_6 = percentage of the high school population who are of Indian or Metis descent--measured in percentage; and

x_7 = size of the high school--measured by the number of students.

Input-Output Table[60]

Previous studies have used input-output tables as a tool to measure the effects of expenditures on a defined area.[61] In this study, the input-output table formulated for the Interlake Area[62] of Manitoba is used to determine the effects of

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[60] A discussion of the data may be found in the following section of this study.

[61] H.B. Chenery, "Development Policies for Southern Italy," Regional Analysis, ed. L. Needleman (Great Britain: The Chaucer Press, 1968); see also William H. Miernyk, Impact of the Space Program on a Local Economy (Parsons, West Virginia: McClain Printing Co., 1967).

[62] This table is taken from James A. MacMillan and Chang-Mei Lu, "Regional Development Planning and Evaluation: An Impact Analysis of Manitoba's Interlake Area Development Plan," Research Bulletin (Winnipeg, Manitoba: Department of Agricultural Economics, University of Manitoba, 1971), pp. 42-45.

educational expenditures on the area. As the formulation[63] of the input-output table is not included in this study, a brief discussion of its features and problems are presented.

An input-output table is used "to show how the output of each industry is distributed among other industries and sectors of the economy.[64] It also gives the relationship between inputs of various industries. The input-output relationships make up the processing sectors of the table. Along with this part of the table, there are the payment sectors which consist of gross inventory depletion, imports, payments to governments, depreciation allowances and households. There is also the final demand sector, which is autonomous from the rest of the table, and this is the sector in which changes occur which have effects throughout the rest of the table. Changes which occur will have an effect on gross output, which

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[63]For the information and appraisal of input-output models see Hugh O. Nourse, Regional Economics (Toronto: McGraw-Hill, 1968), Ch. 6; see also C.M. Tiebout, "Regional and Interregional Input-Output Models: An Appraisal," Regional Analysis, ed. L. Needleman (Great Britain: The Chaucer Press, 1968), p.86.

[64]William H. Miernyk, The Elements of Input-Output Analysis (Parsons, West Virginia: Random House, Inc., 1965), p. 8.

is a measure of the total value of each industry's output.[65]

There are many problems involved in formulating an input-output table. Some of these problems are: (1) the delineation of the industries--which ones should or should not be aggregated, and (2) the units of measurement to be used are of three types--the direct and indirect method at producer's prices and the indirect method at purchaser's prices. Each method has its good and bad points.[66] There are also many problems associated with data collection and classification.[67]

The impact of education expenditures on area business is calculated as follows:[68]

$$X^{Ed} = (I - T^*)^{-1} Ed$$

Where: X^{Ed} = vector showing the change in area sales due to educational expenditures;

I = identity matrix;

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[65]The reference for this section is Miernyk, ibid., pp. 11-14. Output in the Interlake table is measured in terms of sales.

[66]For further discussion of this point, see Richard Stone, Input-Output and National Accounts (Paris: Organization for Economic Cooperation and Development, 1961), pp. 48-51.

[67]For further discussion of these points see both the aforementioned books by Stone, pp. 33-46, and Miernyk, pp.8-16.

[68]The model used is outlined in greater detail in James A. MacMillan and Chang-mei Lu, "Regional Development Planning and Evaluation: An Impact Analysis of Manitoba's Interlake Area Development Plan," pp. 42-45.

T* = input-output coefficient matrix with households included; and

Ed = vector of educational expenditures by sector.

The employment created by the educational expenditure is calculated by multiplying the vector showing the change in area business sales, X^{Ed}, by a diagonal matrix of coefficients:[69]

$$Y = Ed\ (Emp)$$

Where: Y = employment created by education expenditures; and

Emp = diagonal matrix of employment coefficient (number of full-time employee equivalents per $1,000 sales by sector).

Present Value Equations[70]

It is hypothesized that if a student remains in school and successfully completes a higher education level, then net benefits measured in terms of future earnings will increase. If it is assumed that the difference in incomes of people at various education levels is extended over the remainder of their working lives, then these future benefits are measured in terms of the present value.

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[69]The derivation of the procedures for calculating the employment effects are elaborated in James A. MacMillan and Change-mei Lu, "Area Manpower Planning: Projections and Impact Models," Research Bulletin (Winnipeg, Manitoba: Department of Agricultural Economics, University of Manitoba).

[70]Data needed for the equations are discussed in the following section.

It is necessary for the benefits to accrue for more than one year to determine their stability. Also, working life tables are not available for the Interlake Area; therefore, it must be assumed that working life tables for the prairie region developed from the 1961 Census are relevant. The present value of the benefits are then measured as follows:[71]

$$PVB_K = B_K \left[\frac{(1 + r)^{N_x} - 1}{r \quad (1 + r)}\right] \qquad (2)$$

Where: PVB_K = the present value of benefits accruing to the k^{th} individual;

B_K = the benefit accuring to the k^{th} individual;

N_x = the mean expectation of the working life of the k^{th} individual of age;[72] and

r = a selected rate of interest.

To determine the present value of the costs of education, the following formula is used:[73]

$$PVC_K = \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \ldots + \frac{C_n}{(1+r)^n} \qquad (3)$$

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[71] James A. MacMillan, Leo A. Bernat, and John J. Flagler, "Benefits and Costs of Manpower Services in the Interlake Rural Development Area," Research Bulletin (Winnipeg, Manitoba: Department of Agricultural Economics, University of Manitoba), p.42.

[72] Working life tables are available for the prairie region based on the 1961 Census; see Frank T. Denton and Sylvia Ostry, Working Life Tables for Canadian Males (Ottawa: Queen's Printer, 1969).

[73] David G. Quirin, The Capital Expenditure Decision (Homewood, Illinois: Richard D. Irwin Inc., 1967), p. 6.

Where: PVC_K = present value of the costs of the k^{th} individual;

C_n = cost of the individual's education from year 1 to n; and

r = selected rate of interest.

This formula is used because C_K, the cost to the individual, changes over time due to changing opportunity costs as his education progresses. The costs in this model include the opportunity costs[74] of the student, which is measured by the average salary for each grade level[75] and the cost of the individual's education.

Particular assumptions needed for the application of the above model to the benefits and costs of education in the Interlake are:

1. Because social benefits and costs are extremely difficult (if not impossible) to measure, they are assumed to be equal.

2. The benefits and costs to the parents are assumed to be equal.

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[74] This is assuming that a student dropping out of high school will definitely get a job.

[75] This figure is biased downward as the Interlake is a depressed area and wages could be higher if the average wage for Manitoba was used for each level of education attained.

3. It is assumed that the average amount of university training is two years. There are 759 people in the Interlake who have some university education and only 277 who have a degree.[76]

4. It is assumed that the cost of tuition and books is paid by each university student's summer earnings, that is, $500 of costs per year.[77]

5. For the lower income bracket (below ($1,500) and the upper income bracket (above $9,000), average incomes for that bracket stated in The Interlake Fact, Income Data Supplement are assumed to be equal for each education level. For the intermediate brackets, the average of the income bracket is used.[78]

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[76]Charles F. Framingham, James A. MacMillan and David J. Sandell, The Interlake Fact Digest (Winnipeg: Highnell Printing Ltd., 1968), pp. 55-57.

[77]W. Lee Hansen and Burton A. Weisbrod, A New Approach to Higher Education Finance (Madison, Wisconsin: The University of Wisconsin, 1970), p. 14. The $500 figure was arbitrarily chosen.

[78]Taken from Charles F. Framingham, James A. MacMillan, and David J. Sandell, The Interlake Fact, Income Data Supplement (Winnipeg: Highnell Printing Ltd., 1968), p. 2.

6. To calculate the present value of benefits for Selkirk, the St. Andrew's urban income distribution by education levels is used. The St. Andrew's urban classification includes Selkirk and Winnipeg Beach.[79]

7. It is assumed that an interest rate of 6% is appropriate for discounting future earnings.

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[79] Ibid., p. 32. The reason for using Selkirk is to compare the net benefits for the average of the Interlake Area and the higher income urban center in the Interlake Area.

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THE DATA

In this section, the data collection and computational techniques for each of the three methods of analysis used in the model are discussed.

Regression Data

The data described in this chapter consists of the data necessary for the derivation of the regression equation, the method of analyzing the area's education expenditures for use in the input-output table, and the data necessary to calculate the present-value of benefits and costs attributable to higher levels of education.

There are fourteen high schools located throughout the Interlake Area. Data for the Gypsumville High School are not available, therfore, there are thirteen observations for each variable in the regression equation (Table I). The regression equation consists of one dependent and six independent variables which have previously been identified. Each of the seven variables are discussed with regards to its source and its method of computation.

Variable X_1 (dropout rate) was obtained from the Department of Education who compiled tables which included dropouts

from all schools in Manitoba.[80] The table classified dropouts[81] by school and grade and dropouts are extracted for Grades IX to XII inclusive. The total number of dropouts is divided by the school size to obtain the dropout rate.

The data source for variable x_2 (average town income) is The Interlake Fact Digest.[82] For each town, the rural farm, rural non-farm and urban categories are used to obtain a weighted income figure which represents not only the urban community, but the rural area as well, because students come from both the urban and rural areas. In instances where towns have a high school, but where the town is not sufficiently large to be classified as an urban community, the weighted averages of the rural farm and rural non-farm categories are used.

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80 Tables compiled by the Department of Education, Table V, School Dropouts by School, and Grade, Manitoba. September 1, 1968-June 30, 1969. Unpublished data from the Director of Research.

81 Ibid. Dropouts are defined as "...any individual who being reported in a prescribed program of studies in a Manitoba school in September, 1968, terminates his schooling without completing the required work. This definition excludes individuals who cannot continue because of physical injury, illness or death." The rate was adjusted to exclude students moving in or out of the area but does not include students dropping out during the summer period.

82 Framingham, MacMillan, and Sandell, The Interlake Fact Digest.

Variable x_3 (teachers' average salary by town) is obtained from the Department of Education records of teachers' salaries for 1968-69. The teachers' salaries of each high school are extracted from the records, summed, and divided by the total number of teachers to obtain the teachers' average salary.

The fourth variable, x_4 (courses available at each high school), is obtained by telephoning each high school principal and inquiring about the curriculum offered at that high school. To measure the relative differences between high schools, an arbitrary scale is used. The number zero is assigned to any high school that taught only the university entrance courses. If the high school taught one of the available course options it received the number one. If the high school taught two options, then it received the number two, etc. The five available alternatives are: the general course, the commercial course, the industrial course, the vocational course, and the university entrance course.

To compute variable x_5 (extra-curricular activities available at each high school), each principal is asked for a list of the extra-curricular activities available at the high school. Each activity was arbitrarily assigned the number of .1. For example, a school with four extra-curricular activities has a value of .4 assigned for that observation (see Appendix).

Variable x_6 (percentage of the high school population

who are of Indian or Metis descent) is obtained by asking each principal the approximate number of students in that high school who are of Indian or Metis descent. This number is divided by the total size of the high school and multiplied by 100 to obtain the percent of Indian and Metis students in that high school.

The data source for variable x_7 (size of the high school) is the Department of Education records. A simple addition of the enrolments of Grade IX to Grade XII inclusive for each high school yields the necessary figure.

Input-Output Data

The government final demand sector contains expenditures made by the education sector. To determine the effects of educational expenditures on the Interlake Area, the education expenditures are separated from the rest of the government expenditures.

To obtain this data, each school division office is surveyed to obtain the expenditures for the calendar year 1968. The data available at the school division office includes expenditures made outside the Interlake Area. To separate these expenditures from those made in the Interlake Area, each secretary-treasurer is asked to give an estimate of the amount which is spent in the area. This same procedure is

used for each school division in the Interlake.[83]

Each expenditure is classified into one of the seventeen industrial sectors or the household sector.[84] The expenditure for each sector are summed over all the school divisions to obtain the final demand vector of educational expenditures.[85]

Present Value Equations

To calculate the present value of benefits attributable to education, three variables are calculated to solve the present value equation. These variables are:

B_K - the benefit accruing to the k^{th} individual.

n_x = the mean expectation of the working life of the k^{th} individual of age x.

C_K = student's opportunity cost

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[83] One school division, White Horse Plains, was not totally inside the Interlake Area. To estimate the amount spent in the Interlake, the above method of obtaining expenditures was used, then a ratio of the number of students in the Interlake Area attending schools in the White Horse Plains School Division was divided by the total number of students in the White Horse Plains School Division. This ratio was applied to each industrial sector.

[84] It is assumed that the teachers live in the Interlake Area and spend their wages there.

[85] See Table 2.

To calculate B_K, the mean salary is calculated for persons with the education levels Grades 7-8, 9-10, 11-12, and university. Two B_K's are calculated, one for the Interlake and one for Selkirk. The necessary data are extracted from The Interlake Fact, Income Data Supplement.[86]

To calculate the mean income, the number of households in each "Household Income Distribution" section is multiplied by the median income of each section. These products are summed for each education level, then divided by the total number of households in each respective education level. (see sheet).

The other variable which needs to be calculated to solve the equation is n_x. To compute n_x, the approximate age of students at each education level is estimated, then working life tables are used to obtain the mean expected working life of the individual. Substituting these two variables into the equation along with a selected rate of interest determines the present value of benefits.

For determining the present value of costs, the same rate of interest as above is used and the only other variable

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[86] Framingham, MacMillan, and Sandell, op. cit., Table 21C, p. 2, for the B_K pertaining to the Interlake region, and Table 21C, p. 32, for the B_K pertaining to Selkirk.

required is the opportunity cost of the student, C_K. The opportunity cost used is the average income of the Interlake or Selkirk for the education level below the one being calculated. For example, the opportunity cost of a student at the education level 11-12 is the benefits of the education level 9-10. Substituting the cost and the interest rate into the equation yields the present value of costs. To obtain net benefits, the present value of costs are subtracted from the present value of benefits.

The data which has been discussed is used to quantify the three methods of analysis used in the model.

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EMPIRICAL RESULTS

In the previous section, the model has been discussed, and the data needed to quantify it has been presented. In this section, the empirical results are presented and discussed.

Regression Equation

Regression results for the first equation showed that all regression coefficients are not statistically significant at the 5% level, that is, the null hypothesis that the beta values are equal to zero could not be refuted. The reason for this occurence is that the Selkirk observation had a corresponding higher dropout rate than expected and, therefore, tended to result in large error terms which would give a poor fit to the regression line. Selkirk is therefore dropped from the sample. It is an urban centre of 10,000 people, which is much larger than the next largest town. It was thought that due to the size of its high school (1,256 students), students may tend to drop out in greater numbers because of the loss of identity associated with a larger school.

The St. Laurent observation has one variable which gives the equation much variance. The percentage of Indian and Metis students in the high school is 50%, while the next

largest percentage is 10%. The St. Laurent observation is also dropped.

A second regression equation is run with Selkirk and St. Laurent omitted, thereby reducing the number of observations to eleven. The result of this equation is:[87]

$$X_1 = .326890 - .000011x_2 - .000015x_3 - .031695x_4^* - .041893x_5 \quad (4)$$
$$(.165061)\ (.000016)\ (.0000.16)\ (.011481)\ (.023095)$$

$$- .798329x_6^* + .000228x_7^* \qquad R^2 = .904$$
$$(.301398)\ (.000110)$$

The hypotheses for variables x_2 (average town income) and x_3 (teachers' average salary by town) are not supported. For variables x_4 (courses available) and x_5 (extra-curricular activities), the hypotheses are supported at the 5% and 10% levels, respectively. For variables x_6 (percentage of high school population of Indian or Metis descent) and x_7 (size of school), the hypotheses are not supported, because both variables have the wrong sign. The constant in the equation,

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[87] Level of significance (one-tailed t-test); *--5% and **--1%. The bracketed numbers below the regression coefficients are the standard errors of the regression coefficients.

which represents the value of the dependent variable adjusted for all the independent variables, was not significant.

As mentioned above, the size of school may affect the dropout rate in a positive way; therefore, the hypothesis could be that size of schol and dropout rates are related in a positive way. Variable x_6 (percentage of high school population of Indian or Metis descent) also did not have the hypothesized sign. This is not too surprising as it is very difficult for a principal to determine which of his students are of Indian and Metis descent. It is pointed out by several principals that the Indian and Metis students in the high school do not usually dropout,as most of them who are going to drop out have done so by the time they reach high school. The hypothesis is likely incorrect; the greater the percentage of Indian and Metis students in the high school, the lower the dropout rate.

The correlation coefficient between variables x_2 (average town income) and x_3 (teachers' average salary by town) has a value of .78. (Table 5). The level of correlation at which multicollinearity becomes a problem is not known, because the magnitude of biases created by multicollinearity is not known. Farrar and Glauber state that ". . . An admittedly arbitrary rule of thumb is established to constrain simple correlations between explanatory variables to be smaller than,

say r = .8 or .9."[88] If this arbitrary rule of thumb is applied to the analysis in this study, then multicollinearity in this instance is not a problem.

Multicollinearity in regression equations varies with the sample size.[89] Examining the results of this study in the light of the above statement, it can be argued that the high multicollinearity between the variables may be due to the size of the sample.

Christ also states that multicollinearity is not a problem if the use of the regression equation is for forecasting purposes.[90] This is true if it is assumed that the relationship existing between the two variables stays the same for the forecasting period.[91]

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[88]Donald E. Farrar and Rcbert R. Glauber, "Multicollinearity in Regression Analysis: The Problem Revisited," Reading in Econometric Theory, eds. M.M. Dowling and F.R. Glahe (Boulder, Colorado: Colorado Associated University Press, 1970), p. 208.

[89]Carl F. Christ, Econometric Models and Methods, (New York: John Wiley and Sons Inc., 1967), p. 389.

[90]Ibid., p. 389.

[91]Table 5 contains correlation coefficients for the variables used in the regression equation.

Table 5: Summary of Correlation Coefficients

	1	2	3	4	5	6	7
1	1.000000						
2	-0.782695	1.000000					
3	-0.471238	0.786415	1.000000				
4	-0.705642	0.690303	0.578999	1.000000			
5	-0.467071	0.518406	0.312995	0.381965	1.000000		
6	-0.160311	-0.166006	-0.409721	-0.244612	-0.201506	1.000000	
7	-0.519443	0.624213	0.555850	0.712049	0.616066	0.029159	1.000000

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It is stated in the opening paragraph of the study that the purpose of the study is to give policymakers some insight into the areas of education where expenditures are the most productive. This implies that the model is explanatory, suggesting in turn that multicollinearity is not desirable. As there is no way of quantifying the effects of multicollinearity except by trial and error, an alternate form of the regression is used to determine the effects that multicollinearity has on equation (4). When x_2 (average town income) is deleted, the result of the equation is:

$$X_1 = \underset{(.090136)}{.320520^*} - \underset{(.000010)}{.000024x_3^*} - \underset{(.010081)}{.028616x_4^*} - \underset{(.018304)}{.032909x_5} - \underset{(.212832)}{.655841x_6^*} + \underset{(.000087)}{.000185x_7^*} \qquad R^2 = .892 \qquad (5)$$

Variables x_3 (teachers' average salary by town), x_4 (courses available), x_6 (percentage of the high school population of Indian or Metis descent) and x_7 (size of school) are all significant at the 5% level. Variable x_5 (extra-curricular activities available) is significant at the 10% level. The constant is significant at the 5% level.

When x_3 (teachers' average salary by town) is deleted, the result of the equation is:

$$X_1 = .296824^{**} - .000022x_2^{*} - .037427x_4^{**} - .053773x_5^{*} -$$
$$(.072023) \quad (.000010) \quad (.009312) \quad (.018469)$$
$$.940102x_6^{**} + .000268x_7^{*} \qquad R^2 = .885 \qquad (6)$$
$$(.250675) \quad (.000099)$$

Variables x_2 (average town income), x_5 (extra-curricular activities) and x_7 (size of school) are significant at the 5% level. Variables x_4 (courses available) and x_6 (percentage of the high school population of Indian or Metis descent) are significant at the 1% level. The constant is also significant at the 1% level.

It can be argued that the correlation of .78 is sufficiently large in this instance to substantially bias the value of the t-values of variables x_2 (average town income) and x_3 (teachers' average salary). Equation (6) had higher t-values, therefore it would be the better explanatory equation.

The usefulness of the regression results is that it gives the direction that policymakers should pursue if their goal is to lower student dropout rates. The effects that this type of expenditure have on an area is measured by means of an input-output table.

Examining the results in terms of elasticities it is determined that variable x_2 (average town income) has the highest elasticity, and therefore the greatest effect on dropout rates. An increase of 1% in average town income decreases

dropout rates by 1.9%. The other variables which have negative elasticities are: x_5 (extra-curricular activities), x_6 (percentage of the high school population of Indian or Metis descent) and x_4 (courses available). Variable x_7 (school size) has the effect of increasing dropout rates as school size increases.

The implication of these conclusions is that policymakers should concentrate on increasing average town income to attain the greatest reduction in dropout rates. However, the policymaker must determine the effects of each variable in terms of the costs of implementation. It is possible that some effects on dropout rates may be attained by better use of present resources without increasing costs.

Table 6: Summary of Elasticities for Equation (6)

Variable Number	Variable Name	Elasticities
x_2	Average Town Income	- 1.90
x_4	Courses Available	- 0.76
x_5	Extra-Curricular Activities Available	- 1.18
x_6	Percentage of the High School Population of Indian or Metis Descent	- 0.86
x_7	School Size	+ 0.96

Input-Output Table

Input-output analysis is used to determine the effects on area sales, incomes and employment created by any given expenditure. The expenditures include only current expenditures. In this study, the educational expenditures of the Interlake are examined for the calendar year 1968. These expenditures in the Interlake Area total approximately $5,056,000.[92] Salaries consist of $4,594,000[93] of this amount, which is approximately 90% of the total educational expenditures. Salaries thus form the most important aspect of educational expenditures. To determine the effects of these expenditures, the education vector is multiplied by the inverse of the input-output coefficient matrix. The result of this multiplication gives the effects in terms of sales on each of the seventeen industrial sectors, as well as the effects on incomes in the area.[94] The aggregate effect on sales and incomes is to increase them to $8,892,340 from an original $5,056,000.

These increased sales and incomes have imposed a demand upon the system which will create jobs. To determine the num-

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[92] See Paul Molgat, "The Role of Education Expenditures in Area Economic Development" (unpublished Master's Dissertation, University of Manitoba, 1971), Column 1, Table IX, Appendix C.

[93] This figure is the total of the salaries paid to 59 principals, 536 full-time teachers, 10 part-time teachers, 4 superintendents and several other full and part-time administrative and custodian staff, as well as school bus drivers.

[94] These results are seen in Molgat, ibid., Column 19, Table IX, Appendix C.

ber of jobs created by the educational expenditures, the education vector[95] is multiplied by the inverse of the input-output coefficient matrix which is multiplied by the direct employment coefficient vector.[96] The result of the multiplication will yield the number of jobs created in each industrial sector.[97] When summed the results yield the total number of jobs created by the educational expenditures. The total number of additional jobs induced is 98.986, or approximately 99 jobs.

The effects of educational expenditures on area sales, income and employment can be compared to the effects of other types of expenditures as listed in Table 6. The purpose of this table is to illustrate the important implications attributable to changes in a given expenditure category. It is used to compare the effects of equal amounts of expenditures by two categories.

For example, education and sales to travellers both involve approximately the same amount of expenditure. The

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[95]See Molgat, ibid., Column 1, Table XI, Appendix C.

[96]See Molgat, ibid., Columns 2 to 18 inclusive in Table XI, Appendix C. The direct employment coefficient vector is from Table X, Appendix C.

[97]See Molgat, ibid., Column 19, Table XI, Appendix C.

education expenditure has a larger multiplier effect (a ratio of 1:1.14). Both expenditure categories generate approximately the same amount of agriculture sales and income (a ratio of 1:1.06). However, in terms of total area income generated, sales to travellers substantially exceed that of education (a ratio of 1:2.35), whereas the opposite is the case for agriculture income (a ratio of 1:10.6). In terms of non-agricultural jobs created, sales to travellers more than doubles the education expenditure category (a ratio of 1:2.44). The conclusion which follows from the analysis of these figures is that sales to travellers create better opportunities for the non-agricultural sectors, while education has a proportionately larger effect on the agricultural sector. However, it is necessary to determine the recreation expenditure required to stimulate the $5 million in sales to travellers. Governments can use this type of analysis to determine where expenditures should be made to stimulate various sectors.

In conclusion, input-output analysis of this type is used by the policymaker to decide a priori the effects which will occur in various sectors if certain expenditure categories are stimulated.

Table 7: Summary of Sales, Income and Job Impacts in the Interlake Area Economy By Expenditure Categories in 1968

Expenditure Category	Expend. Level	Total Area Sales & Income Generated	Agr. Sales Income Generated	Total Area Income Generated	Agr. Income	No. of Non-Agr. Jobs Created
		millions of dollars				
FRED	2.4	2.9	0.160	1.586	.045	34
Sales to Travellers	5.2	7.8	0.157	1.336	.044	220
Exports by Agr. Live-stock	1.0	1.9	1.073	0.353	0.795	11
Agr. Crops	1.0	1.9	1.042	0.381	0.313	12
Mining	1.0	1.6	0.010	0.323	0.003	48
Food & Bev. Manuftg.	1.0	2.5	0.724	0.384	0.200	33
Other Mfg.	1.0	1.6	0.010	0.325	0.003	59
Air Base Closure	2.3	2.9	0.039	0.345	0.011	256
Education[a]	5.1	8.9	0.167	0.568	0.467	99

[a]This row of numbers is obtained by extracting and/or manipulating the area input-output coefficient table and the employment table. This row has been included in the table for purposes of comparison.

Source: James A. MacMillan and Chang-mei Lu, "Regional Development Planning and Evaluation: An Impact Analysis of Manitoba's Interlake Area Development Plan," Research Bulletin (Winnipeg, Manitoba: Department of Agricultural Economics, University of Manitoba), p. 5.

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Present Value Equations

Based on the assumption in the section on model formulation, the effect on student's earnings attributable to higher levels of education can be determined by calculating the net benefits of increased amounts of education.[98] To do this, the present value of benefits and costs are calculated, then subtracted to determine net benefits. The net benefits for both Selkirk and the Interlake Area are calculated.

The present value of benefits for Selkirk and the Interlake are presented in Table 8.

Table 8: Changes in Income, and Present Value of These Changes for the Interlake and Selkirk

	Change in Income (Benefits)		Present Value Of Benefits	
	Interlake	Selkirk	Interlake	Selkirk
Grades 7-8 to 9-10	$1,476/yr	$ 4,074/yr	$23,040	$ 63,595
Grades 7-8 to 11-12	$3,045/yr	$ 7,130/yr	$47,076	$110,230
Grades 7-8 to University	$5,524/yr	$12,206/yr	$83,965	$185,531

Source: Derived from Charles F. Framingham, James A. MacMillan, and David J. Sandell, The Interlake Fact, Income Data Supplement (Winnipeg, Manitoba: Highnell Printing Ltd., 1970), pp. 2 & 32, according to methods outlined.

[98] The benefits and cost of taking technical vocational training cannot be measured due to data problems.

The present value of the costs associated with increased amounts of education are:

Table 9: Present Value of Cost of Increased Education

	Present Value of Costs	
	Interlake	Selkirk
Grades 7-8 to 9-10	0[a]	0[a]
Grades 7-8 to 11-12	$14,099	$23,721
Grades 7-8 to University	$36,589	$62,683

[a]As the minimum age of a child leaving school is sixteen, most students' cost of achieving Grades 9 or 10 will be zero, as their opportunity cost in terms of employment is near zero.

Source: Derived from Charles F. Framingham, James A. MacMillan, and David J. Sandell, The Interlake Fact, Income Data Supplement (Winnipeg, Manitoba: Highnell Printing Ltd., 1970), pp. 2 and 32, according to calculations outlined.

The net benefits are shown in Table 10.

Tentative conclusions can be drawn from this analysis, but the assumptions made in the section dealing with model formulation must be kept in mind. Greater benefits are achieved if employment is in a larger center such as Selkirk. The net benefits of increased amounts of education rise as educational levels rise.

The results of the three methods of analysis indicate the type of variables that affect dropout rates, the effect of

education on area sales, income and employment, and the net benefits of increased amounts of education.

Table 10: Net Benefits of Increased Education

	Present Value of Benefits		Present Value of Costs		Net Benefits	
	Interlake	Selkirk	Interlake	Selkirk	Interlake	Selkirk
Grades 7-8 to 9-10	$23,040	$ 63,595	0	0	$23,040	$ 63,595
Grades 7-8 to 11-12	$47,076	$110,230	$14,099	$23,721	$32,977	$ 86,509
Grades 7-8 to University	$83,965	$185,531	$36,589	$62,683	$47,376	$122,848

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LIMITATIONS AND FURTHER RESEARCH

The statistical analysis has two limitations:[99] the sample size, and the data availability.

The study deals with the Interlake Area of Manitoba; therefore, only high schools located in the defined area are used as observations. There is a total of fourteen high schools, but data for the Gypsumville High School are not available, and the Selkirk observation is removed from the sample, as is the St. Laurent observation. The reason for dropping these observations are stated in the previous section. This left the analysis with only eleven observations. As there are six independent variables in the regression equation, this left only four degrees of freedom for testing the results. Generally, a larger number of degrees of freedom is preferable, but this is not possible because of the area under study.

The second limitation of the statistical analysis is the data. All data used, except for the data for the income variable, are from secondary sources. The income variable is obtained from The Interlake Fact,[100] but all other variables

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[99] The analysis is conducted on the assumption that the institutional system remains constant.

[100] Framingham, MacMillan, and Sandell, op. cit.

are obtained either from the Department of Education or from the appropriate high school. All the variables could be more accurately measured using a survey technique, but this is impossible due to time and money constraints.

The limitations of input-output analysis are found in the books by Miernyk[101] or Stone[102]. The data used for the education vector in the input-output table is obtained by separating each Interlake school division's expenditures into expenditures made in the Interlake Area and those made outside the area. To obtain this breakdown, the secretary-treasurer of each school division in the Interlake Area is consulted. This breakdown of expenditures between the Interlake and other areas could also have been obtained by examining each expenditure made by the school division in 1968, but again, due to time and money constraints, this is impossible.

The analysis of net benefits should include the benefits and costs incurred by all levels of society. It was previously mentioned that benefits and cost of education at the general society level and at the family level are very difficult to

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[101] William H. Miernyk, The Elements of Input-Output Analysis (Parsons, West Virginia: Random House Inc., 1965).

[102] Richard Stone, Input-Output and National Accounts (Paris: Organization for Economic Co-operation and Development, 1961).

measure. For this analysis, the net benefits are calculated from an individual's point of view. The analysis would be more complete if the net benefits are also calculated for the other levels.

There are also serious limitations in the data used to calculate the equations. To calculate benefits, the assumption pertaining to all income brackets lead to upward biases for benefits of low income people, and downward biases for high income people. This assumption reduces the range of the benefits calculated.

A second limitation in calculating benefits is that no differentiation is available from the data source between people having a university degree or just some university training. This tends to bias university income downwards. Further research into the measurement of social benefits and costs is needed before true net benefits are calculated.

The field of educational economics is a relatively new area of study. With reference to the present study, several areas could use further research. One area for research would include a proper method to measure quality variables. A second area would be to test the model to determine its generality. If the model is general, then it can be used to predict the effects of educational expenditures on dropout rates with increased educational expenditures. A third area would be to

determine the limit to which the significant variables will affect dropout rates. For example, teacher's salaries could not be increased without limit to reduce dropout rates to nil. At some point, increasing teacher's salaries will not likely affect dropout rates. This type of limit should be known before large amounts of money are spent for any one variable which affects dropout rates.

In terms of the broader issue, further research is needed to define an appropriate measure of educational productivity. Such a measure is essential to determine the total amount of money which should be spent for the education of people. Another area for research would be to determine the optimal school size, considering costs as well as dropout rates. In this instance, dropout rates are a measure of the benefits.

Interdisciplinary research would also be helpful. The book Disadvantaged Children[103] discusses the relationship between health, nutrition and school failure. Research in the area of dropouts could try to weight the dropouts of various communities in such a way that the disadvantages of children

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[103]Herbert E. Birch and Joan Dye Gussow, Disadvantaged Children, Health, Nutrition and School Failure (New York: Harcourt, Brace and World Inc., 1970).

in impoverished areas are accounted for. If it is found that health and nutrition are significant factors in accounting for dropouts, then this would have some policy implication.

This section has discussed some basic limitations of the study. It has also mentioned areas in which further research could be continued.

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CONCLUSIONS

The objective of this study was to investigate three relationships and thereby establish a viable framework for determining the role of education in area economic development. The limitations of the study are discussed in the previous section.

The first problem was to determine which independent variable(s) (which included average town income, teachers' average salary by town, courses available, extra-curricular activities, percentage of the high school population of Indian or Metis descent, and school size) best explain(s) dropout rates. This was accomplished by collecting the necessary data and using regression equation (6) to determine the results. Variables x_4 (courses available), x_6 (percentage of the high school population of Indian or Metis descent) and the constant are significant at the 1% level. Variables x_2 (average town income), x_5 (extra-curricular activities available) and x_7 (size of school) are significant at the 5% level.

The conclusion derived from examining the elasticities is that average town income has the most significant effect on dropout rates. The implication is that policymakers should consider policies to increase town incomes, if lowering drop-

out rates is an objective of the government.

The second problem was to determine the effects on sales and incomes of expenditures in the education sector. This was achieved by determining the 1968 educational expenditures for the Interlake Area. These expenditures were multiplied by the inverse of the Interlake input-output table. The effect was to create $3,267,907 in area sales and $568,437 in area income. This represents a total of $3,836,344 of area sales and incomes generated from an educational expenditure of $5,055,996.

It was possible to determine the number of jobs created by expenditures in the education sector. The total jobs induced are approximately 99. If we assume that the coefficients remain constant over time, the impact of any future educational expenditures in the area can be determined by using the input-output table.

The third problem was to determine the net benefits of higher levels of education. This was accomplished by determining the present value of costs and the present value of benefits associated with increased amounts of education. Due to assumptions and the limitations of the data, exact (precise) conclusions from this particular analysis on a society level are impossible. For an individual, the net benefits of continued education are quite significant. For example, the net benefit for the average Interlake town for a Grade XII educa-

tion was $32,977, while for a university education it was $47,376. There were greater net benefits received in Selkirk as opposed to the average Interlake town. For example, the net benefits available to a student having a university degree in Selkirk are $122,848 while the Interlake average is $47,376.

What general conclusion can be drawn with respect to the broad issue stated in the opening paragraph of the study? Although the study does not attempt to answer the question of how much money should be spent for education, it does point out the direction in which educational expenditures should be made. The conclusion is that certain quality variables are significant for decreasing the dropout rates of high school students, and this is one area of education where money could be spent. How much should be spent is another question which has yet to be answered.

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APPENDIX: List of School Extra-Curricular Activities

	Selkirk	St. Laurent	Stonewall	Tuelon
Art Club	*		*	
Audio-Visual Club	*			
Badminton Club	*		*	*
Band	*			
Botany Club	*		*	
Bowling	*			
Centennial Club	*			
Chess Club	*		*	
Choir	*		*	
Curling Club	*	*	*	*
Drama	*		*	*
Newspaper	*	*	*	*
Explorer's Club	*			
Field Hockey (Girls)	*		*	*
Film Club	*		*	
French Club	*		*	
Gymnastic Club	*		*	
Judo	*		*	*
Library Club	*		*	
Pep Club	*			
Ping Pong	*		*	
Publicity	*			
Public Speaking	*			
Reach For The Top Team	*			
Rythmics	*			
Science Club	*	*	*	*
Soccer	*	*	*	*
Social Committee	*			
Stage Crew	*			
Stamp Club	*			
Tennis	*		*	
Track and Cross-Country	*	*	*	*
Volleyball	*	*	*	*
Weight Training Club	*			
Wrestling	*			
Yearbook	*	*	*	*
Football		*	*	*
Hockey		*	*	*
Dances		*	*	
Basketball			*	*
Fastball				*

	Warren	Arborg	Gimli	Riverton
Art Club	*			
Badminton	*	*		
Band				
Botany Club				
Bowling				
Centennial Club				
Chess Club	*		*	
Choir				
Curling Club		*	*	*
Drama	*	*	*	*
Newspaper	*	*	*	*
Explorer's Club				
Field Hockey (Girls)	*			
Film Club	*			
French Club	*			
Gymnastic Club	*			
Judo			*	
Library Club				
Pep Club				
Ping Pong	*			
Publicity				
Public Speaking				
Reach For The Top Team				
Rythmics				
Science Club	*		*	
Soccer	*	*	*	
Social Committee				
Stage Crew				
Stamp Club				
Tennis			*	
Track and Cross-Country	*	*	*	
Volleyball	*	*	*	*
Weight Training Club				
Wrestling	*			
Yearbook	*	*	*	*
Football		*	*	*
Hockey	*	*	*	*
Dances			*	
Basketball	*	*	*	*
Fastball	*			*

	Ashern	Eriksdale	Fisher Branch
Art Club			
Badminton			
Band			
Botany Club			
Bowling			
Centennial Club			
Chess Club			
Choir			
Curling Club	*		*
Drama	*		*
Newspaper	*	*	*
Explorer's Club			
Field Hockey (Girls)			
Film Club			
French Club			
Gymnastic Club			
Judo			
Library Club			
Pep Club			
Ping Pong			
Publicity			
Public Speaking			
Reach For The Top Team			
Rythmics			
Science Club	*		
Soccer	*		*
Social Committee			
Stage Crew			
Stamp Club			
Tennis			
Track and Cross-Country		*	*
Volleyball	*	*	*
Weight Training Club			
Wrestling			
Yearbook	*	*	*
Football	*		*
Hockey		*	*
Dances	*	*	*
Basketball	*	*	*
Fastball		*	

	Lundar	Moosehorn
Art Club	*	
Badminton	*	
Band		
Botany Club		
Bowling		
Centennial Club		
Chess Club	*	
Choir		
Curling Club	*	*
Drama	*	*
Newspaper	*	
Explorer's Club		
Field Hockey (Girls)		
Film Club		
French Club		
Gymnastic Club		
Judo		
Library Club	*	
Pep Club		
Ping Pong	*	
Publicity		
Public Speaking		
Reach For The Top Team		
Rythmics		
Science Club	*	*
Soccer	*	*
Social Committee		
Stage Crew		
Tennis	*	
Track and Cross-Country	*	*
Volleyball	*	*
Weight Training Club		
Wrestling		
Yearbook	*	*
Football	*	*
Hockey	*	
Dances	*	*
Basketball		*
Fastball	*	

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